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"A Mechanical Prophet"

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A CALCULATING machine, 11 ft. long, 2 ft. wide, and 6 ft. high, has been found by the U. S. Coast and Geodetic Survey to be a very handy thing to have in the house.

It is the tide-predicting machine and, because of the accuracy of the results obtained by its use and the facility with which it handles the various complicated types of tide occurring in different parts of the world, has been referred to as "A Mechanical Prophet with Brains."

Like all modern conveniences, the development of tide tables has been gradual, and improvements constant. Issued by the Federal Government in 1853, the first tide tables consisted of condensed data for only eight stations, all in the United States. Since then they have been gradually increased in scope and, as now issued each year, comprise a volume of about five hundred pages. The entire maritime world is covered, with full predictions of the time and height of each high and low water at 84 of the principal ports in all countries and with additional tidal information for about 3,500 subsidiary ports, the use of which, in connection with the data for the principal ports, enables predictions to be easily made for practically any port in the world.

This publication is called "Tide Tables, United States and Foreign Ports" and is issued in advance each year by the Coast and Geodetic Survey. It contains more than a million figures, and it is evident that scores of trained mathematicians would be required if the individual values thus

represented had to be computed. The tidal mathematician and the mechanical engineer, however, have solved the problem by designing a machine which does the calculating even more accurately than skilled mathematicians.

A tidal table gives for any specific point the time and height of each successive high and low water referred to some datum plane. Predictions are usually made two years
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Extra Meeting

IN the months of April and October, at the time of the quarterly sessions of the Society, the monthly meeting held at Society Headquarters in New York is usually omitted, or perhaps may be more correctly described as held elsewhere than in New York.

Contrary to this usual procedure, however, owing to the fact that the vote on a Constitutional Amendment is to be counted at the October meeting, there will be a meeting of the Society in New York on the evening of October 5th.

The subject to be presented is an analysis of some unusual ideas on the design of centrifugal pumps by Professor Allen F. Sherzer, Associate Member. The paper is among those in this month's issue of Proceedings. So unusual are some of Professor Sherzer's ideas that they have been considered revolutionary and possibly to controvert established facts. Discussion both oral and written, therefore, may be expected to be spirited.

Columbus

October 12, 13, 14 and 15

THOSE who have any sort of interest in the technical problems incident to the control of the Mississippi River should find the Columbus meeting, October 12th, 13th, 14th and 15th, one not to be missed.

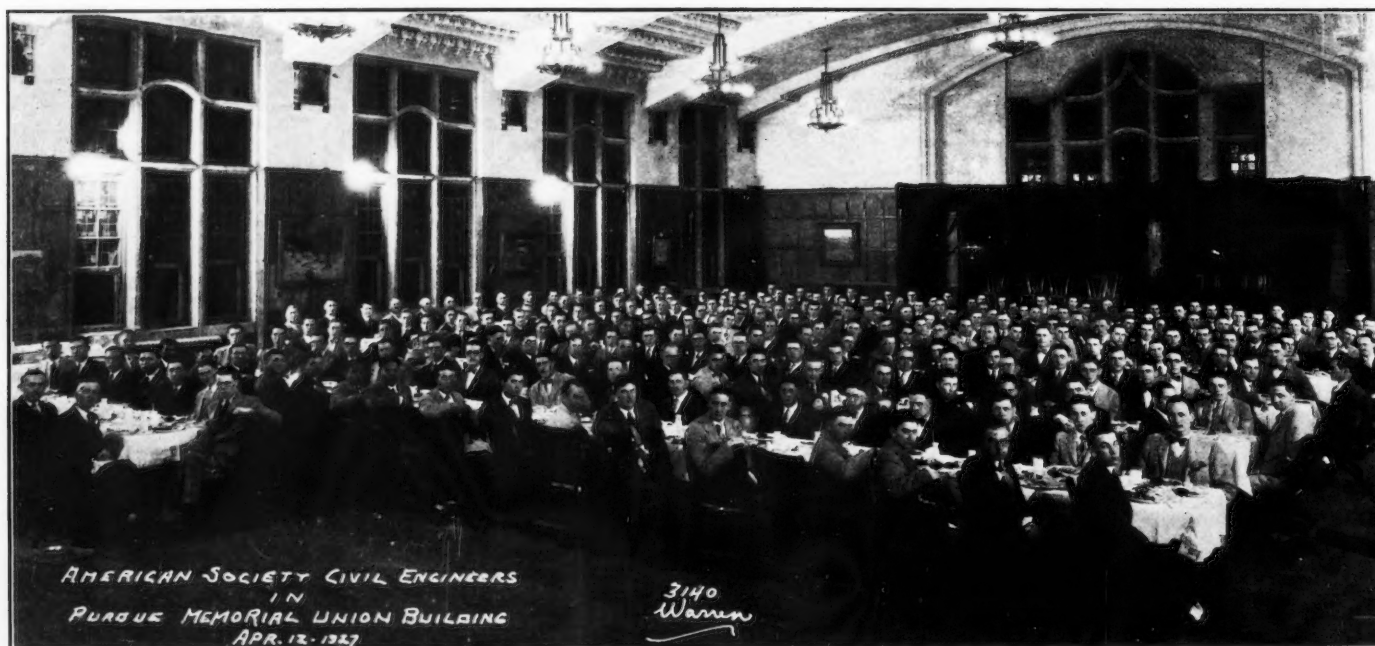
Societies, Chambers of Commerce, political interests, and individuals have memorialized the President describing the recent flood as a national disaster calling for a national program that will insure no similar recurrence. Special treatments have been proposed, and panaceas have been urged—many with sincerity and in a spirit of real, although perhaps uninformed, helpfulness.

It remains for the Society, however, to apply the knowledge and experience of its members, skilled in the subject, to an analysis of the problem and a study of the preventive measures that may be applicable, and a glance at the program shows the completeness with which the subject will be covered and the adequacy of the treatment.

The portions of the meeting under the direction of the Highway Division, the Structural Division, and the Sanitary Engineering Division, in addition to the exposition of the features of the Columbus water supply development and subsequent treatment, should provide valuable information for those who are interested in subjects other than river control.

Thus, taken all in all, and not forgetting the football game and the other opportunities to renew and extend acquaintances, the Columbus meeting should prove an unusual gathering, attractive to many.

COLUMBUS
OCTOBER 12, 13, 14 AND 15



*A Student Chapter Annual Banquet
At Purdue University*

"Constitutional Juniors"

SHOULD you, at perhaps the Columbus meeting, happen to meet two men of about 60 years of age who, however, display the badge of a Junior, do not be too sceptical of their right to do so. The right is theirs. They are what are familiarly called "Constitutional Juniors."

In the Constitutional provisions for admission to the Junior grade is the following sentence: "Persons who were in the Junior class prior to March 4, 1891, shall not have their status changed by the provisions of this section." The provisions referred to are that a Junior's connection with the Society shall cease when he becomes 32 years of age, unless he be previously transferred to another grade, and of the 215 men at that time in the grade of Junior, there now remain 2 who never have changed their status.

They, therefore, are still Juniors, at least so far as the Society's rating is concerned, although neither holds a junior position in his professional work.

A Penny Saved

ON the list of applicants appearing in each issue of Proceedings a slight change has recently been

made with regard to the position of the numbers. The abstracts are arranged alphabetically and each is numbered. Heretofore these numbers were in the first line of type and could be assigned with certainty only at the last minute and the changes involved caused expense. Now the number is put in a line by itself, no changes are necessary and surprising as it may seem it is estimated that approximately \$150 in printers' wages is saved to the Society in the course of a year.

Founder Societies

WHO are the Founder Societies and what are they, has often been asked. Similarly, what is United Engineering Society? What is Engineering Foundation? What is American Engineering Standards Committee? What is American Engineering Council?

All these questions are asked and more particularly query arises as to what is the relation of a member of the Society to any one of these units.

In general, the answer is the same for each. They are organizations carrying on some phase of engineering activity which is of interest to all the organized engineers of the country. None of them has the character of groups of individuals and in this sense none of them is an association. Rather, they have the

character of agents for the participating associations of individual engineers. They are joint activities of the several engineering societies.

The term, Founder Societies, applies to the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society of Civil Engineers.

The term came into use at the time of the organization of United Engineering Society when the first three Societies named entered into the agreement setting up that unit to act as their agent in the administration of property and funds entrusted to it, comprising more particularly the land and building to be occupied by the Societies as a joint home. Upon joining in that agreement at a later date the American Society of Civil Engineers took its place as one of the four Founder Societies.

The structure of these several joint agencies, their activities, and their finances has recently been a matter of study by a committee of the Board of Direction, and by order of the Board its report is printed at length in this issue of Part I of the Proceedings, the entire section usually devoted to Items of Interest this month being given over to this subject. All interested in the relation the Society bears to these joint activities will do well to study the data.

The Society— A Service Bureau

IT is important to know what you need; sometimes it is even more valuable to know just where you can get it. Two quite different types of visitors, recently received at Society Headquarters and each faithfully and gladly served, illustrate this truth.

Two Japanese engineers, representatives of the Japanese Bureau of Public Works and introduced by the Acting Consul General, have been sent to the United States to study the Mississippi River flood, more particularly as to the nature of the levee system and its details and incidentally to observe the general practices that prevail in America with respect to earthen dams for any purpose.

Upon arrival their first call was at Society Headquarters with the request that they be provided with a suggested itinerary and other facilities for seeing what was most worth while along the line of their particular interest. They were welcomed, invited to utilize the Society Rooms in any way, introduced at the Library, provided with selected books, furnished with a detailed itinerary of points to visit, and equipped with letters of introduction to members of prominence throughout the country. It seemed to all parties concerned to be quite a matter of course that such service was to be expected and gladly rendered.

On almost the same day a young engineer, really a "would be" engineer (not a member), sought advice as to how he might secure a technical education with the expenditure of a minimum of time and also of money. A program for him was just as carefully worked out as was that for the Japanese visitors. Even if virtue is its own reward, the appreciation expressed by this future engineer was pleasant to hear. He marveled that he had been able to learn in a few minutes what he had failed to unearth in months of previous inquiry.

Student Chapters

TO be a member of one of the Student Chapters of the Society is to be one of a rather large brotherhood. There are now 89 such Chapters, membership in which last winter totaled nearly 5000.

As plainly indicated at the Stu-

dents' Conference held last April at the time of the Asheville meeting, qualifications for membership vary greatly with the different Chapters. At one or two institutions membership is conditional upon scholastic standing, at others it is confined to members of only the Senior and Junior classes. Others include the three upper classmen and still others take in also the Freshmen who are proposing to take Civil Engineering.

By action of the Board, members of the first-year class, although members of the Student Chapters, are not permitted to wear the Society's Student Badges.

Interstate Water Disputes

THE following resolution was passed unanimously by the Irrigation Division at the Denver Meeting, July 14, 1927:

"WHEREAS, experience has plainly demonstrated that the problem of interstate river controversies, if left to chance solution, leads to costly and protracted litigation involving tremendous economic loss to all concerned; and

"WHEREAS, efforts to adjust interstate river problems by means of treaties or compacts between the states and the United States Government directly interested promises a more direct and practicable solution of the problems involved;

"NOW, THEREFORE, BE IT RESOLVED, that the Irrigation Division of the American Society of Civil Engineers definitely recommends that the proper state agencies at the earliest possible date take the initiative in starting and completing such negotiations as will bring about the solution of interstate water difficulties, through treaty or compact, on such broad lines as are best fitted to the individual streams on which such rights may be in controversy."

A Winter Trip

THE American Institute of Mining and Metallurgical Engineers is arranging a mid-winter cruise to the West Indies, leaving New York on January 25, 1928, on the steamship "Lapland," and returning on February 19, after having visited Havana, Kingston, the Panama Canal, Curacao, with a side trip to the oil fields of Venezuela, Puerto Cabello, La Guayra, and Bermuda.

If it is eventually found possible to accept booking from among others than the membership of that Society, those who first signify their interest in the cruise will be given the first opportunity to participate.

October Proceedings

IN the October Proceedings fifteen papers appear. Of these, nine have already been delivered before Technical Divisions of the Society. It so happens that the remainder, with one exception, all apply to engineering problems of water in some aspect or other—a rather unusual, but wholly accidental, occurrence.

According to Allen F. Sherzer, Associate Member, as described in his "New Theory for the Centrifugal Pump," the design of such apparatus is simply a question of discharging water through three orifices.

"The Hydraulic Design of Flume and Siphon Transitions," by Julian Hinds, Member, covers a wide variety of conditions. Mr. Hinds fortifies his conclusions by citing many actual examples from Western reclamation work.

From a wide experience, William H. Cushman, Member, discusses "Water Power Appraisals," showing the advantages of various methods.

One of the major waterway problems of the world, "The Great Yangtze Bar" near Shanghai, China, has been studied for years by H. von Heidenstam, Member. His paper presents many of the difficulties with possible solutions yet to be tested.

Under the title "Side Spillways for Regulating Diversion Canals," W. H. R. Nimmo, Associate Member, discusses theory and practice, the latter as illustrated by an Australian example.

"A Graphic Method for Determining the Stresses in Circular Arches Under Normal Loads by the Cain Formula," by Frederick Hall Fowler, Member, gives graphs for the rapid solution of this important, but usually lengthy, engineering problem.

Several papers on surveying appear in the October Proceedings. These include "Boundary Surveys," by Clarence T. Johnston, Member; "Surveys on the Coast of New Jersey," by Victor Gelineau, Member; and "Surveying and Mapping in the United States," by C. H. Birdseye, Member. These papers, delivered before meetings of the Surveying and Mapping Division, cover the various topics comprehensively, and will appeal to the student as well as to the practicing engineer.

Two papers on waterways, presented at the Philadelphia meeting are here printed—"Advances in Waterways Engineering During a Half Century," by Maj. Gen. W. M.

Black, Member; and "The Delaware River from Philadelphia to the Sea," by Col. Frank C. Boggs, Member. These papers received favorable comment when they were presented, and should attract considerable discussion.

Four papers delivered before the Highway Division are also included under the following topics: "Traffic Control by Electric Signal Lights," by M. O. Eldridge, Associate Member; "Traffic Control on City Streets, New York, N. Y.," by Philip D. Hoyt, Chairman of the Traffic Board, Police Department; "Snow Removal from City Streets, New York, N. Y.," by Elmer C. Goodwin, Associate Member, and "Snow Removal from City Streets, Boston, Mass.," by Edward F. Murphy, Deputy Commissioner of Public Works. These problems of traffic control and snow removal are of major importance to all city engineers. It is not too much to hope that helpful suggestions will result from these excellent papers.

The usual discussions and memoirs conclude the October Proceedings. These number 29 discussions on 15 papers already presented; and brief biographical sketches of 7 deceased members.

"A Mechanical Prophet"

(Continued from page 1)

in advance and the tables issued about six months prior to the beginning of the calendar year for which they are made, so that they can be distributed throughout the world in time for use on January 1. While these predictions are determined only two years in advance they can be made, should it be necessary for any purpose, with equal ease and accuracy as long in the future as one pleases.

Until 1882, the tides for the United States were computed by means of tables and diagrams, a laborious method which limited the data to only a few stations. Beginning in 1882, the predictions were made on the Ferrel Tide Predictor, designed by William Ferrel of the Survey. While this machine served satisfactorily for the simple tides occurring on the coasts of the United States, it was not satisfactory for the more complicated tides occurring in some other parts of the world.

In 1910, the new machine was put in operation and by its aid it is now easily possible to make predictions for any port in the world, handling

with equal facility the simple tides of the Atlantic and the complicated tides of the East Indies. The machine indicates by dials the time and height of each successive high and low water and, at the same time, draws a continuous curve showing graphically the rise and fall of the tide.

As is well known, tides are due to the action of the sun and moon on the rotating earth. Now if the motions of the sun and moon relative to the earth only took place in circular orbits in the plane of the equator, tidal predictions would be a simple matter. But these motions are not so simple, and the tidal mathematician, therefore, has substituted for the complicated motions of the sun and moon relative to the earth the simple circular motions of a number of hypothetical suns and moons, the combined tidal effects of which are equal to those of the real sun and moon.

Each such hypothetical moon or sun, to the number of 37, and each representing a simple tide due to the relative motions of these bodies with respect to the earth may be expressed by a constant, and it is the job of the machine to combine these separate influences. Each constant

is represented on the machine by a double system of pulleys and the effects of each constant are combined by means of a fine flexible chain which passes over each constant's pulley, transmitting the resultant motion of all the pulleys to dials by which the time and height of each successive tide is directly indicated.

Before making predictions for a station a series of tide observations is obtained, and the tide wave, as it actually occurs, is broken up into its theoretical simple tides by the harmonic analysis. By this mathematical treatment the actual tide at the station is resolved into its simple waves or harmonic constants. The values thus obtained for these constants are set on the tide-predicting machine which, when put into motion by a system of gears, sums up these simple tides into the tide of Nature.

It requires about 3 hours, taking the necessary safeguards against possible human error, to set these values for the prediction of a station. Once set up, the operator turns a crank and 7 hours is then required for the machine to foretell the times and heights of the more than 1400 high and low waters that will occur at that station in a future year.

The
Mechanical
Prophet
with
Brass
Brains

